

U 015129-1

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**We claim:**

1. A solid catalyst, consisting of partially halogenated metal oxide or mixed metal oxide or zeolite or zeolite-like solid, represented by a general formula  $X(a)P_bMO_c(OH)_d$  wherein, X is halogen element selected from F, Cl, Br and I; P is phosphorous element; M is at least one metallic element selected from alkaline earth metals, rare earth metals, group IIIa metals, non-noble transition metals, Sn, Sb, Bi, Si, thorium and uranium; O is oxygen; H is hydrogen; a is the concentration of halogen element X present in the catalyst in the range from 0.01 wt % to 50 wt %; b is the mole ratio of P to M in the range from zero to 1.0; c and d are the number of oxygen and OH groups, respectively, required to satisfy the valence requirement of the metallic and non-metallic elements (M and P); and the ratio of d to c in the range from zero to about 1.0, with or without any catalyst support, useful for the Friedel-Crafts reactions.
2. A catalyst as claimed in claim 1 wherein the halogen element is Cl.
3. A catalyst as claimed in claim 1 wherein the metallic element (M) is Be, Mg, Ca, Si, B, Al, Ga, In, Tl, Cr, Fe, Cu, Ni, Y, Th, La, Ce, Pr, Bi or a mixture of two or more thereof.
4. A catalyst as claimed in claim 1 wherein the concentration of halogen element in the catalyst (a) is between 0.1 wt % and 30 wt %.
5. A process for the preparation of a solid catalyst, consisting of partially halogenated metal oxide or mixed metal oxide or zeolite or zeolite-like solid, represented by a general formula:  $X(a)P_bMO_c(OH)_d$  wherein, X is halogen element selected from F, Cl, Br and I; P is phosphorous element; M is at least one metallic element selected from alkaline earth metals, rare earth metals, group IIIa metals, non-noble transition metals, Sn, Sb, Bi, Si, thorium and uranium; O is oxygen; H is hydrogen; a is the concentration of halogen element X present in the catalyst in the range from 0.01 wt % to 50 wt %; b is the mole ratio of P to M in the range from zero to 1.0; c and d are the number of oxygen and OH groups, respectively, required to satisfy the valence requirement of the metallic and non-metallic elements (M and P); and the ratio of d to c in the range from zero to about 1.0, with or without any catalyst support, useful for the Friedel-Crafts reactions.  
which comprises;
  - (i) contacting an inorganic solid comprising surface hydroxyl groups, represented by a general formula:  $P_bMO_n(OH)_m$  wherein, P is phosphorous, M is at least one metallic element selected from alkaline earth metals, rare earth metals, group IIIa metals, non-noble transition metals, Sn, Sb, Bi, Si,

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thorium and uranium; O is oxygen; H is hydrogen; b is the mole ratio of P to M in the range from zero to 1.0; n and m are the number of oxygen and OH groups, respectively, required to satisfy the valence requirement of the metallic and non-metallic elements (M and P), and the m to n ratio is above about 0.0001, with or without any catalyst support, with an halogenating agent selected from hydrogen fluoride, hydrogen chloride, hydrogen bromide, hydrogen iodide or gaseous halogens in the presence or absence of moisture-free non-aqueous solvent and inert gas, such that the concentration of halogen in the catalyst is in the range from 0.01 wt % to 50 wt %; and

(ii) desorbing physically adsorbed halogen containing compound from the halogenated solid.

6. A process as claimed in claim 5 wherein, the halogenating agent is anhydrous hydrogen chloride or  $\text{Cl}_2$ .
7. A process as claimed in claim 5 wherein, the metallic element [M] in the inorganic solid is Be, Mg, Ca, Si, B, Al, Ga, In, Tl, Cr, Fe, Cu, Ni, Y, Th, La, Ce, Pr, Bi or a mixture of two or more thereof.
8. A process as claimed in claim 5 wherein the non-aqueous solvent is liquid hydrocarbon, carbon tetrachloride or dichloroethane.
9. A process as claimed in claim 5 wherein the concentration of halogen in the catalyst is between 0.1 wt % and 30 wt %.
10. A process as claimed in claim 5 wherein in step- ii, the physically adsorbed or adsorbed halogen or halogen containing compound from the halogenated inorganic solid is removed by desorption from the catalyst in a flow of inert gas such as nitrogen, helium or argon.
11. A process as claimed in claim 5 wherein when a non-aqueous solvent is used in step-i, after the desorption of physically adsorbed or adsorbed halogenating agent, the resulting halogenated catalyst is filtered under moisture-free atmosphere and is dried under vacuum to remove the solvent from the catalyst.
12. A process for the benzylation of an aromatic compound comprising i) contacting a pretreated catalyst of claim 1 with 15  $\text{cm}^3$  liquid reaction mixture containing aromatic compound and benzyl chloride or benzoyl chloride and optionally a solvent under vigorous stirring while bubbling moisture-free  $\text{N}_2$  gas through the reaction mixture ii) cooling the reaction mixture to room temperature, separating the solid catalyst from therefrom by filtration to obtain a benzoylated aromatic compound.

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13. A process as claimed in claim 12 wherein the separated catalyst is washed with moisture-free solvent selected from benzene and toluene and recycled.
14. A process as claimed in claim 12 wherein the catalyst is of the general formula  $X(a)_bMO_c(OH)_d$  wherein, X is halogen element selected from F, Cl, Br and I; P is phosphorous element; M is at least one metallic element selected from alkaline earth metals, rare earth metals, group IIIa metals, non-noble transition metals, Sn, Sb, Bi, Si, thorium and uranium; O is oxygen; H is hydrogen; a is the concentration of halogen element X present in the catalyst in the range from 0.01 wt % to 50 wt %; b is the mole ratio of P to M in the range from zero to 1.0; c and d are the number of oxygen and OH groups, respectively, required to satisfy the valence requirement of the metallic and non-metallic elements (M and P); and the ratio of d to c in the range from zero to about 1.0, with or without any catalyst support.
15. A process as claimed in claim 14 wherein, the halogenating agent is anhydrous hydrogen chloride or  $Cl_2$ .
16. A process as claimed in claim 14 wherein, the metallic element [M] in the inorganic solid is Be, Mg, Ca, Si, B, Al, Ga, In, Tl, Cr, Fe, Cu, Ni, Y, Th, La, Ce, Pr, Bi or a mixture of two or more thereof.
17. A process as claimed in claim 14 wherein the non-aqueous solvent is liquid hydrocarbon, carbon tetrachloride or dichloroethane.
18. A process as claimed in claim 14 wherein the concentration of halogen in the catalyst is between 0.1 wt % and 30 wt %.